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BRIEF REPORT

Cross-cultural adaptation and validation of the Portuguese version of the Knee Outcome Survey-Activities of Daily Living Scale (KOS-ADLS)

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Abstract The objective of this study was to cross-culturally adapt and validate the Portuguese version of the Knee Outcome Survey-Activities of Daily Living Scale (KOS-ADLS). This version was obtained with forward/backward translations, consensus panels and pre-testing. The Portuguese KOS-ADLS and Medical Outcomes Study, 36-item Short Form (SF-36) questionnaires, visual analogue scales (VAS) of pain, disability and discomfort, and a form for patient's characteristics were administered to 168 subjects with knee osteoarthritis (OA). Reliability was acceptable (Cronbach's alpha=0.91; ICC=0.97). There were significant correlations with SF-36 physical component subscales, all VAS, and duration of knee OA. The subjects with bilateral knee OA and that need walking aids obtained lower scores ($p<0.001$). No floor/ceiling effects were detected. Responsiveness to physical therapy was showed (standardized effect size=0.62; standardized response mean=1.02). The Portuguese KOS-ADLS evidenced acceptable reliability, validity, floor/ceiling effects, and responsiveness.

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Introduction

Patient-oriented questionnaires on health-related quality of life, health status, and functional status are widely used to evaluate health care outcomes. These tools provide significant information about the perceived impact of specific diseases and conditions on individuals [1, 2]. In the context of knee OA generic (e.g., SF-36 [3]; EuroQol [4]), disease-specific (e.g., Western Ontario and McMaster Universities Osteoarthritis Index [5]; Lequesne Algofunctional Index [6]) and site-specific instruments (e.g., Knee injury and Osteoarthritis Outcome Score [7]; KOS-ADLS [8]) are most common. The greater number of existing patient self-administered questionnaires have their origins in Anglo-American scientific literature [9]. The use of these instruments in other cultures or different languages requires a cross-cultural adaptation and validation [10].

The KOS-ADLS was developed for the evaluation of patients with knee disorders, including knee OA, assessing the symptoms (pain, crepitus, stiffness, swelling, instability, and weakness) and the functional disability that could be felt during the performance of daily living activities (walking, stairs ascending/descending, standing, kneeling, squatting, and chair sitting/rising) [8]. It has the advantage of being easily used to follow patients with different knee problems throughout the life span.

The objective of this paper was to realize the translation and cultural adaptation of the KOS-ADLS to the Portuguese language (for use in Portugal) and to study its reliability, validity, floor/ceiling effects, and responsiveness in patients with knee OA.

Materials and methods

Cross-cultural adaptation

This process followed previously established guidelines [9, 11]. The American-English KOS-ADLS was used as starting point with permission from the author [8]. This version was translated into Portuguese separately by two translators. The two resultant translations were used in a first consensus panel to obtain the first preliminary version. This consensus version was translated back to American-English language separately by another two translators without previous contact with the original version. The translations and back translations were used in a second consensus panel to obtain the second preliminary version. In order to assure that all items of the questionnaire were comprehensible, this consensus version was filled out by 10 subjects with specific knee conditions. A third consensus panel took place to obtain the final version of Portuguese KOS-ADLS questionnaire.

Validation study

Subjects

The sample consisted of patients with symptomatic knee OA fulfilling the clinical and radiographic criteria of the American College of Rheumatology [12], attending 10 physical therapy outpatient clinics in Portugal during a 6-month period. Subjects were selected after obtaining informed consent and checking the inclusion and exclusion criteria. To be included in the study, subjects had to require physical therapy treatments (related to knee OA) with an expected duration of at least 4 weeks and experience knee pain from OA with a score of at least 30 mm on a 0 to 100 mm VAS. Subjects were excluded if they had attended physical therapy treatments (related to knee OA) in the previous 30 days, had other lower limb osteoarthropathy, neurological disease, or any other disabling condition or if they were unable to read and write Portuguese fluently. All physical therapy outpatient clinics obtained approval from their respective review boards.

Measurements

Measurements were performed at the clinics. The whole sample was assessed in the first clinic visit and again 48 h later. In six of the 10 physical therapy outpatient clinics all subjects were assessed once more after 4 weeks of physical therapy treatments. Data were collected in a questionnaire format using the translated patient self-completion measures.

The KOS-ADLS [8] contains 17 items which assess the level of knee function through a final global score that ranges from 0 (lower level of function) to 100 (higher level of function). The American-English KOS-ADLS satisfies standard criteria for reliability, validity, and responsiveness [8, 13].

The SF-36 [3] contains 36 items that cover eight subscales: physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, and mental health. A score, from 0 (worst possible health status) to 100 (best possible health status), is separately produced for each subscale. The SF-36 was cross-culturally adapted to the Portuguese language [14], and this version was validated [15].

Three VAS were used to assess the intensity of knee pain, degree of disability related with the knee, and the degree of discomfort in walking, respectively. All the VAS ranged from 0 (no problems) to 100 mm (extreme problems). The VAS has been found to be reliable and valid in evaluating subjects with knee-specific conditions [16].

A form was used to acquire subject information on gender, age, body mass index, duration of knee OA (from diagnosis of knee OA), involved knee (knee with OA), and walking aids.

Statistical analyses

Reliability Internal consistency was assessed using Cronbach's alpha and corrected item-total scale correlations. An alpha value between 0.70 and 0.95 was considered as acceptable reliability [17]. Corrected item-total scale correlation of 0.30 or higher was considered acceptable for each item in the scale [18]. Reproducibility over 48 h was evaluated using ICC. A reliability coefficient of 0.70 or higher was considered as acceptable for group comparisons [10].

Validity Construct validity was tested by relating KOS-ADLS scores with variables that could be expected to have an association with them (SF-36 physical component subscales, all VAS, and duration of knee OA) and by comparing KOS-ADLS scores obtained by different subgroups based on grouping variables that could be expected to produce statistically significant differences (involved knee and walking aids). Construct validity was tested using Spearman's correlation and Mann–Whitney test. Spearman's correlation coefficients were interpreted as follows: excellent relationship, ≥0.91; good, 0.90–0.71; fair, 0.70–0.51; weak, 0.50–0.31, little or none, ≤0.30 [19]. A p value of 0.05 was taken as the level of significance.

Floor/ceiling effects Floor/ceiling effects were considered present if more than 15% of the participants receive either the lowest-possible or highest-possible score of the scale [17].

Responsiveness Responsiveness to 4 weeks of physical therapy was assessed using the standardized effect size and

standardized response mean. The effect sizes were calculated as described by Husted et al. [20]. A value of 0.80 or higher was considered high responsiveness [20].

All statistical analyses were conducted with Statistical Package for the Social Sciences, SPSS® 15.0 for Windows® (SPSS Inc., Chicago, IL, USA).

Results

Cross-cultural adaptation

The second preliminary version of Portuguese KOS-ADLS questionnaire was well-accepted in the pre-test. All the questions and response options were considered satisfactorily comprehensible by the subjects. Therefore, this version was not subjected to any additional modification and was used in the validation study.

Validation study

Subjects

A total of 168 patients (Table 1) were included in the reliability, validity, and floor/ceiling effects assessment, of which 107 (64%) were also included in the responsiveness assessment.

Table 1 Characteristics of the subjects (N=168)

Characteristics	Baseline data
Gender	
Female	126 (75.0)
Age (years)	67.8±7.8
Body mass index (kg/m^2)	28.5±3.8
Duration of knee OA (years)	9.3±6.7
Involved knee (knee with OA)	
Bilateral	108 (64.3)
Walking aids	
No aids necessary	131 (78.0)
KOS-ADLS final global score (points)	45.0±17.3
VAS (mm)	
Pain	68.9±20.1
Disability	66.0±22.7
Discomfort	70.6±21.0
SF-36 subscales scores (points)	
Physical functioning	37.7±21.0
Role-physical	33.7±24.7
Bodily pain	29.4±18.8
General health	36.6±17.3
Vitality	36.3±24.9
Social functioning	58.1±28.5
Role-emotional	44.9±29.0
Mental health	50.1±27.1

Quantitative variables, mean±standard deviation; categorical variables, frequency (percentage)

Reliability

Cronbach's alpha coefficient was 0.91 and corrected item-total scale correlations ranged from 0.40 to 0.78. ICC was 0.97 for the KOS-ADLS final global score and between 0.88 and 1.00 for the 17 items of the questionnaire.

Validity

There were significant correlations with SF-36 physical component subscales, all VAS, and duration of knee OA (Table 2). The subjects with bilateral knee OA and that need walking aids obtained lower scores (p<0.001).

Ceiling/floor effects

None of the subjects reached the worst possible or best possible scale scores.

Responsiveness

Results are summarized in Table 3.

Discussion

We translated and culturally adapted the KOS-ADLS to the Portuguese language and presented evidence of its reliabil-

Table 2 Relationship between KOS-ADLS final global score and SF-36 physical component subscales scores, pain, disability, discomfort and duration of knee OA (N=168)

			KOS-ADLS final global score
SF-36 physical component subscales scores	Physical functioning	r	0.69
		p	<0.001
	Role-physical	r	0.60
		p	<0.001
	Bodily pain	r	0.55
		p	<0.001
	General heath	r	0.34
		p	<0.001
VAS	Pain	r	−0.53
		p	<0.001
	Disability	r	−0.55
		p	<0.001
	Discomfort	r	−0.56
		p	<0.001
Duration of knee OA		r	−0.23
		p	0.002

Spearman's correlation coefficient (KOS-ADLS and SF-36 are 0–100 points, worst to best; VAS is 0–100 mm, best to worst)

Table 3 Standardized effect size and standardized response mean (N=107)

		Standardized effect size (effect size I)	Standardized response mean (effect size II)
KOS-ADLS final global score		0.62	1.02
SF-36 subscales scores	Physical functioning	0.38	0.46
	Role-physical	0.45	0.66
	Bodily pain	1.00	1.11
	General heath	0.31	0.48
	Vitality	0.49	0.59
	Social functioning	0.24	0.30
	Role-emotional	0.31	0.45
	Mental health	0.42	0.57

ity, validity, floor/ceiling effects, and responsiveness in patients with knee OA.

The cross-cultural adaptation process resulted in a reasonably comprehensible Portuguese version of the KOS-ADLS. Bizzini and Gorelick [21] also reported the absence of particular difficulties during the translation and cultural adaptation of a German KOS-ADLS. The intelligible wording of all questions and response options seems to facilitate the selection of commonly used words in others cultures or languages and, consequently, to make the questionnaire easy to understand by people with knee problems.

High Cronbach's alpha coefficient and acceptable corrected item-total scale correlations demonstrated that the 17 items of the Portuguese KOS-ADLS are adequately correlated with each other. The results for internal consistency were similar to those obtained by the original American-English version in patients with several disorders of the knee (Cronbach's alpha coefficients of 0.92–0.93 and corrected item-total scale correlations ranging from 0.19 to 0.81) [8], and by a German version in non-operative and postoperative knee patients (Cronbach's alpha coefficient of 0.89 and corrected item-total scale correlations ranging from 0.83 to 0.88) [21]. High ICC for the final global score and for the 17 items of the questionnaire revealed that the stability of the Portuguese KOS-ADLS over time was acceptable. Similar results were obtained in other studies, 0.97 by Irrgang et al. [8], 0.93 by Marx et al. [13] and 0.94–0.97 by Bizzini and Gorelick [21]. The instrument appears to provide internally consistent and reproducible results either for patient groups with knee OA or for less homogeneous patient groups (various knee injuries and disorders) [8, 13, 21].

The hypotheses for construct validity were confirmed. As anticipated, the Portuguese KOS-ADLS was associated with SF-36 physical component subscales, intensity of pain, degree of disability, degree of discomfort, and duration of knee OA; and was able to discriminate groups of patients based on involved knee and walking aids. The construct validity of other questionnaire versions had already been supported by correlation with other self-reported measures and performance-based tests of function [8, 13, 21]. The scores of the original American-English version exhibited fair to good correlations with Lysholm Knee Scale (r=0.78–0.86) and global rating of function (r=0.66–0.75) [8]. Marx et al. [13] also found good to excellent positive correlations with various knee outcome measures (r=0.68–0.85) and SF-36 physical component scale (r=0.77). A German KOS-ADLS showed moderate correlations with selected functional tests (timed get up and go and timed stairs ascending/descending), and high correlations with VAS of pain intensity [21].

A lowest score of 15.0 points and a highest score of 91.3 points were obtained for the Portuguese KOS-ADLS, which reveals the absence of floor/ceiling effects. Marx et al. [13] also found no floor/ceiling effects for athletic patients. The questionnaire covers a wide range of symptoms and daily living activities which can contribute to minimize the floor/ceiling effects. In the study of Irrgang et al. [8] minimum ceiling effect (0.9–5.6%) was detected but only after 1, 4, and 8 weeks of physical therapy. Bizzini and Gorelick [21] also found minimum ceiling effect (one individual). This may be attributed to the inclusion of patients with less severe knee conditions.

The results of the responsiveness assessment showed that the Portuguese KOS-ADLS was able to detect changes over time. Medium standardized effect size and large standardized response mean were found after 4 weeks of physical therapy treatments. With the exception of bodily pain, all SF-36 subscales presented lower standardized effect size and standardized response mean. This confirms that specific measures tend to be more responsive than generic measures [22, 23]. Irrgang et al. [8] found a standardized effect size of 0.44, 0.94, and 1.26 after 1, 4, and 8 weeks of physical therapy treatments, respectively, in patients with knee injury and OA [8]. Marx et al. [13] also reported a large standardized response mean (1.1) after a minimum of 3 months of operative or non-operative treatments in patients with primary disorders of the knee.

Some limitations of this study should be highlighted. In fact, only patients with knee OA attending physical therapy

treatments in outpatient clinics were recruited. This sample does not represent the whole population of Portuguese patients with knee OA. Besides, KOS-ADLS is a site-specific instrument that could be used to assess not only patients with knee OA but also patients with other knee-specific clinical conditions. Because the reliability, validity, and responsiveness of patient-oriented outcome measures are population-specific [2], the psychometric properties evidenced by the Portuguese KOS-ADLS in this study may be somewhat different in other populations with knee injuries.

In conclusion, the Portuguese version of the KOS-ADLS obtained in this study evidenced reliability, validity, floor/ceiling effects, and responsiveness comparable to the original American-English version. Further testing is required in other populations (e.g., patients with patellofemoral pain, ligamentous, and meniscal injuries).

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